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| Project Overview page 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Name of Project:** | | | Planetary Pass | | | | | | | | | | | | | | | | **Duration:** | | | 2 weeks | | | | | | |
| **Subject/Course:** | | | **Algebra 2** | | | | | | | **Teacher(s): Bond, Harris** | | | | | | | | | **Grade Level:** | | | 11 | | | | | | |
| **Other Subject Areas to Be Included:** | | | English 3, Physics, Ecology | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Project Idea**  Summary of the issue, challenge, investigation, scenario, or problem: | | | In Algebra 2, students will use quadratic functions to investigate the motion and kinetic energy of a football on different planets in the solar system. Students will work in teams to collect data on the trajectory of different sized objects thrown from a catapult. Then, students will write a lab report explaining their methods and presenting the results in the form of a graph and a fitted quadratic function.  In English 3, students will students will research the U.S. space shuttle program. Students will perform pre-writing and create a persuasive essay related to one issue associated to the U.S. space program. | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Essential Question** | | | How can a quadratic function be used to model the height and distance of a projectile? How does the motion of the projectile change when the gravitational field changes?  What should be the direction of the U.S. Space program for the next 20 years? | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Content Standards** to be taught and assessed**:** | | | Algebra 2:  SPI 3103.1.3 Use technology tools to identify and describe patterns in data using non-linear and transcendental functions that approximate data as well as using those functions to solve contextual problems.  SPI 3103.1.4 Use mathematical language, symbols, definitions, proofs and counterexamples correctly and precisely to effectively communicate reasoning in the process of solving problems via mathematical modeling with both linear and non-linear functions.  SPI 3103.2.2 Compute with all real and complex numbers.  SPI 3103.2.3 Use the number system, from real to complex, to solve equations and contextual problems.  SPI 3103.3.2 Solve quadratic equations and systems, and determine roots of a higher order polynomial.  SPI 3103.3.13 Solve contextual problems using quadratic, rational, radical and exponential equations, finite geometric series or systems of equations.  Physics:  SPI 3231.1.3 Given Newton's las of motion, analyze scenariso related to inertia, force, and action-reaction.  SPI 3231.1.4 Solve motion and conceptual problems regarding velocity, acceleration, and displacement using dispcacement-time graphs and velocity-time graphs.  SPI 3231.1.11 Given a projectile launched at an angle, select the correct equation from a list for calculating: the maximum height of travel, time of flight and/or the maximum horizontal distance covered.  SPI 3231.1.12 Given a scenario where a projectile is being launched at an angle, answer the following conceptual questions: 1) What is the velocity in the y direction when the projeectile is at maximum height? 2) What acceleration does the projectile have in the x direction after launched. 3) What forces are acting on the projectile in the y direction before it reaches maximum height?  Ecology:  **CLE 3255.T/E.2** Differentiate among elements of the engineering design cycle: design constraints, model building, testing, evaluating, modifying, and retesting  **CLE 3255.T/E.4** Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.  English 3:  (reading op/ed pieces on nature vs nurture and create a persuasive essay)  CLE 3005.2.6 Deliver effective oral presentations.  CLE 3005.3.2 Employ various prewriting strategies.  CLE 3005.5.2 Analyze text for fact and opinion, cause-effect, inferences, evidence, and conclusions.  CLE 3005.5.3 Evaluate an argument, considering false premises, logical fallacies, and quality of evidence presented.  CLE 3005.5.4 Analyze the logical features of an argument. | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | **T** | **A** | **E** |  | | | | | | | | | **T** | | **A** | | | **E** |
| **Professional (21st Century) Skills** to be taught, assessed and/or encouraged**:** | | | Collaboration | | | | | | | | X |  | X | Other: | | | | | | | | |  | |  | | |  |
| Communication (Oral Presentation) | | | | | | | | X |  | X |  | | | | | | | | |  | |  | | |  |
| Critical Thinking/Problem Solving | | | | | | | | X | X | X |  | | | | | | | | |  | |  | | |  |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Major Products & Performances** | Group: | | | * Group lab report including data, graph of trajectory, the fitted quadratic relationship, and the kinetic energy for various size projectiles. | | | | | | | | | | | | | | | | **Presentation Audience**   **Presentation Audience:**      Class   School | | | | | | | | |
|  | Class X | | | | | | | |
|  | School X | | | | | | | |
|  | Community | | | | | | | |
| Individual: | | | * Persuasive essay on the direction of the U.S. Space Program (English 3) * Project worksheets with results of calculations (Algebra 2) | | | | | | | | | | | | | | | |  | Experts X | | | | | | | |
|  | Web | | | | | | | |
|  | Other: | | | | | | | |
| Project Overview page 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Entry Event** to  launch inquiry,  engage students: | | Invite an astronomer from the Dyer Observatory to come to speak to the students about the US space program and the effect of gravity. (Alternative, take approximately half of students to Dyer Observatory and approximately havl to the Adventure Science Center.)  In Algebra 2, use marble launchers to demonstrate the path of a marble projectile. Discuss with students which parent function most resembles the motion of the projectile as it rises and then falls back to the ground. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Assessments** | | **Formative Assessments**  (During Project) | | | | X | | Quizzes/Tests | | | | | | | |  | | Practice Presentations | | | | | |  | | |
| X | | Journal/Learning Log | | | | | | | |  | | Notes | | | | | |  | | |
| X | | Preliminary Plans/Outlines/Prototypes | | | | | | | |  | | Checklists | | | | | |  | | |
|  | | Rough Drafts | | | | | | | |  | | Concept Maps | | | | | |  | | |
|  | | Online Tests/Exams | | | | | | | |  | | Other: | | | | | |  | | |
| **Summative Assessments**  (End of Project) | | | | X | | Written Product(s), with rubric:  \_\_\_\_\_persuasive essay\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | | | | | X | | Other Product(s) or Performance(s), with  rubric:\_LabReport\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | | |  | | |
|  | | Oral Presentation, with rubric | | | | | | | |  | | Peer Evaluation | | | | | |  | | |
| X | | Multiple Choice/Short Answer Test | | | | | | | |  | | Self-Evaluation | | | | | |  | | |
|  | | Essay Test | | | | | | | |  | | Other: | | | | | |  | | |
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| **Resources Needed** | | **On-site people, facilities:** | | | | | | |  | | | | | | | | | | | | | | | | | | | |
| **Equipment:** | | | | | | | Laptop cart for research, calculators, marble launcher, catapult (options are to purchase or build), various sizes of round objects for experiment, tape measure, camera | | | | | | | | | | | | | | | | | | | |
| **Materials:** | | | | | | | Copies of articles on US space program, copies of project worksheets | | | | | | | | | | | | | | | | | | | |
| **Community resources:** | | | | | | | Astronomer from Dyer Observatory | | | | | | | | | | | | | | | | | | | |
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| **Reflection Methods** | | **(Individual, Group, and/or Whole Class)** | | | X | | Journal/Learning Log | | | | | | | |  | | Focus Group | | | | | |  | | |  | | |
| X | | Whole-Class Discussion | | | | | | | |  | | Fishbowl Discussion | | | | | |  | | |  | | |
|  | | Survey | | | | | | | |  | | Other: | | | | | |  | | |  | | |